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Range extension of *Prestoea pubens* var. *pubens* H.E.Moore (Arecales: Arecaceae) in Colombia

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Abstract: This study reports an extension of 275 km to the known distribution of the understory palm *Prestoea pubens* var. *pubens*. Originally recorded from the Gorgona and Gorgonilla islands and along the Pacific coast of Colombia, the new record is from a Tropical Montane Cloud Forest in Caquetá, which is located on the eastern slopes of the East Colombian Andes. This new record makes the species trans-Andean, showing a disjunctive distribution that also occurs with other understory palms such as *Aiphanes simplex*, *Chamaedorea pygmaea* and *P. ensiformis*.

Key words: allopatric variety; Andes; Caquetá; cloud forest; understory palm

The tropical Andes are among the most biologically diverse areas of the world in terms of species richness and endemism. The high biodiversity rates are frequently attributed to characteristics of and changes in landscape through time (Moritz et al. 2000; Trénel et al. 2008; Sarkinen et al. 2012). The Andean Tropical Montane Cloud Forest (TMCF) is a tropical Andean ecosystem that plays an essential role in the local and regional water cycles (Aldrich et al. 1997; Fahey et al. 2016). However, expansion of agriculture and urbanisation are causing much deforestation in TMCF areas (Etter & Wyngaarden 2000; Armenteras et al. 2003). Consequently, this ecosystem has been highly fragmented (Aldrich et al. 1997; Brummitt & Lughadha 2003; Gotsch et al. 2015). The cloud forests are remarkable for their high occurrence of the family Arecaceae, with 24 genera and 109 species of palms, most of which occurring in the northern portion of the Andes (Borchsenius & Moraes 2006). In this region, palm species can represent up to 40% of the total plant basal area (Borchsenius & Moraes 2006; Cuello & Cleef 2009).

The Arecaceae comprises 200 genera and 2,450 species distributed in tropical and subtropical regions of the two hemispheres (Borchsenius & Moraes 2006; Barfod et al. 2011). There are 24 genera and 109 recognized species of this family occurring over 1,000 m above sea level (a.s.l.) in the Andes, most of them in the northern portion of the range (Moraes et al. 1995; Borchsenius & Moraes 2006). Colombia has one of the highest figures in terms of palm species, with 45 genera and 252 recorded species, 50 of which are endemic to the Andes (Galeano 1992; Galeano & Bernal 2010; Galeano et al. 2015). The genus *Prestoea* Hook.f. comprises nine species, occurring from Costa Rica and most of the Caribbean islands through to Bolivia, including seven reported in Colombia (Galeano & Bernal 2010). The understory palm *P. pubens* H.E.Moore (Moore 1980: 30–38) (Arecales: Arecaceae) has two allopatric varieties: *P. pubens* var. *semispicata* (de Nevers & A.J.Hend.) A.J.Hend. & Galeano (Henderson & de Nevers 1988: 213–216; Henderson & Galeano 1996: 68–70) and *P. pubens* var. *pubens* (Henderson & Galeano 1996: 68). In Panama and in Central America *P. pubens* var. *semispicata* is recorded; in turn, *P. pubens* var. *pubens*, is reported in the Cauca and Valle departments of Colombia from sea level to 1,000 m a.s.l. on the western slopes of the western Andes, and in the Gorgona and Gorgonilla islands on the Pacific coast of Colombia (Henderson & Bernal 1996; Calderón et al. 2005). The species as a whole is classified as Low Concern (LC) according to IUCN criteria (IUCN 2016), but the conservation status of the var. *pubens* has not yet been assessed.

The spatial and temporal distribution of plants and animals has inspired research by biogeographers and ecologists (Guisan & Thuiller 2005). Information about the geographic distribution of species has important implications for the understanding of patterns of biodiversity distribution. Such knowledge is essential for the formulation of policies to effectively preserve natural resources, increase ecosystem services, and mitigate climate change (Austin 2007; Mota-Vargas & Rojas-Soto 2012).

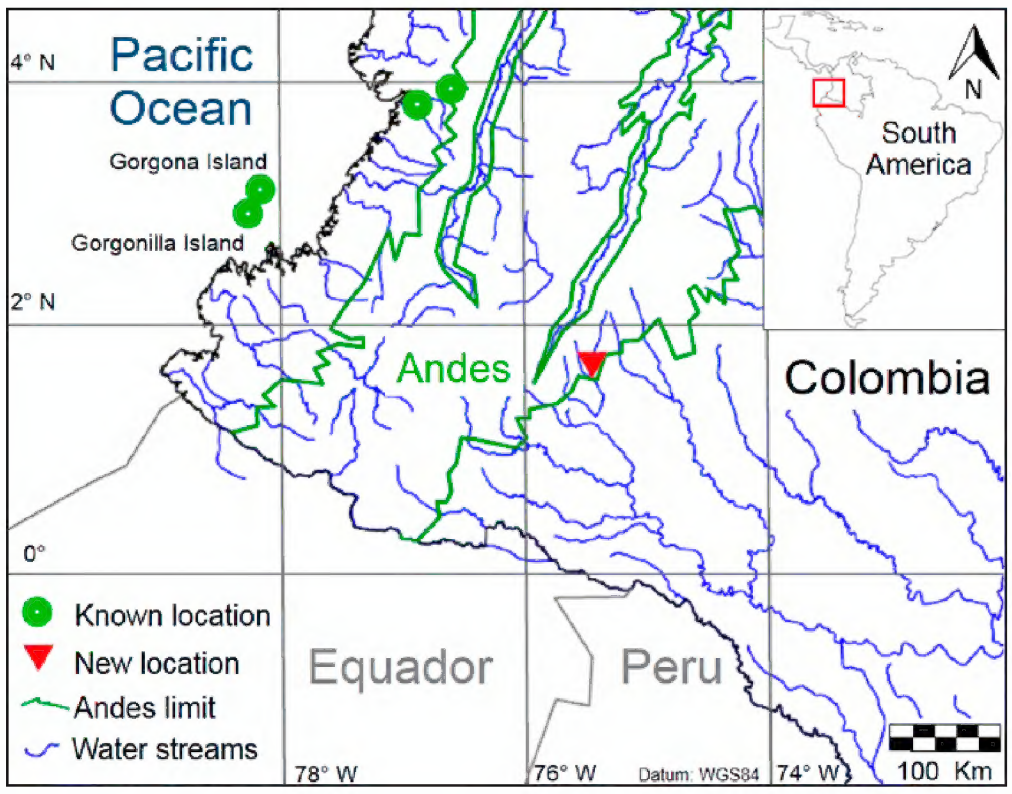


Figure 1. Previous known distribution and new record of *Prestoea pubens* var. *pubens* in Colombia.

Therefore, new scientific collections and reports of the distribution of palms are relevant for the knowledge, study and protection of this important taxonomic group. Research on TMCF biota and the family Arecaceae remains scant but has grown substantially in the last years (Galeano et al. 2015). This study contributed to this knowledge by reporting a new record of *P. pubens* var. *pubens* in the Colombian TMCF, acknowledging the implications of these findings for biodiversity conservation in this ecosystem.

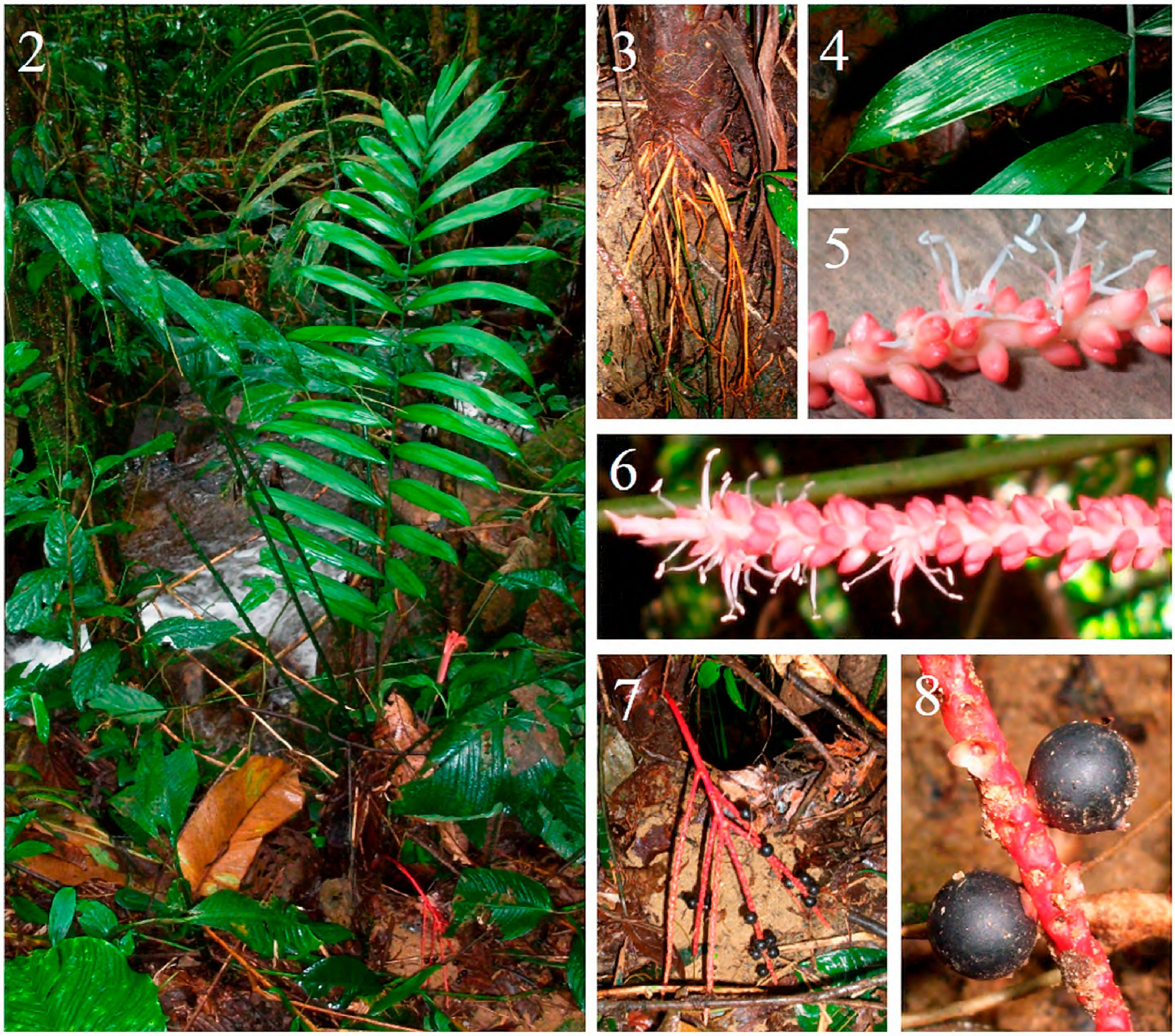
The specimen of *P. pube*ns var. *pubens* was found on 22 May 2012, and collected on 18 October 2015, in a remnant of TMCF at 1,224 m a.s.l., in the El Caraño community (01°44′47.1″ N, 075°41′35.9″ W; Figure 1). The forest patch is located on the eastern slopes of the East Andes ridge, between the Andes and Amazonian ecosystems in Florencia, Caquetá, Colombia. The population of *P. pubens* var. *pubens* was observed in the forests along both sides of the Caraño River and some of its tributaries, from 950 to 1,300 m a.s.l. The voucher (*E. Trujillo 2693*, *HUAZ 18507*) was collected according to Dransfield (1986), under the license 1006, issued in August 2014 by Corpoamazonia.

The species is solitary, small, 1.5–2.5 m high, and occurring in the understory (Figure 2). The palm is acaulescent, and the base of the plant is formed by leaf bases (Figure 3), 7.3 cm in diameter and a brownish colour. *Leaves* 7, arching, total length 190–230 cm; *sheath* closed for 50% of its length, not forming a crownshaft, 15–25 cm in length; *petiole* 90–110 cm in length, 7–12 mm in diameter, green; *rachis* with 95–105 cm of length, 3–7 mm of diameter, *pinnae* elliptic, convex, with prominent mid-vein and several lateral veins, contracted proximally and distally, ending abruptly in an apex extension like a long thin tail of 5–10 cm (Figure 4), basal pinnae 13–15 cm long and 20–35 mm wide, middle pinnae 20–25 cm long and 30–45 mm wide, apical pinnae 9–20 cm long, the first pinnae in the rachis base 10–20 cm long and 15–35 mm wide, 14–17 pinnae each side, sub-opposite, regularly arranged and spreading in one plane, the apical pinna irregularly bifid. *Inflorescence* corymbose, interfoliar, arching, branched; peduncle 35–45 cm long, 3–7 mm in diameter, reddish rachillae 3–7, 15–18 cm long, one peduncular brownish bract, 45–50 cm long. *Flower* staminate 2–2.6 mm long; petals with a tuft of white hairs at apex; endosperm lightly (then almost homogeneously) to deeply ruminate (Figures 5–6). *Infructescence* branched, 3–10 reddish rachillae (Figure 7). *Fruit* globose 9–11 mm in diameter, epicarp black when ripe (Figure 8), slightly coarse thin mesocarp, fibrous endocarp, endosperm lightly (then almost homogeneously) to deeply ruminate. The smaller staminate flowers (2–2.6 mm), petals with a tuft of white hairs at apex and more rachilae (3–10), differs *P. pubens* var. *pubens* from its allopatric var. *semispicata* (Henderson & Galeano 1996). This variety is unmistakable by its elliptic convex pinnae ending in a long thin tail. The specimen was identified by the palm specialist Dr. Rodrigo Bernal, according to Henderson & Galeano (1996). We also compared the collected material with collections of *P. schultzeana* (Burret) H.E.Moore (Burret 1939: 326–328; Moore 1980: 30–38), *P. pubens* var. *pubens* and *P. pubens* var. *semispicata* from the Herbario Nacional Colombiano (COL) to confirm the identification.

The northern region of the Andes, where the specimen was recorded, harbours a high plant richness, resembling the lowland Amazon basin (Henderson et al. 1991; Svenning et al. 2009). However, a large portion of the species is poorly known in terms of ecology and spatial distribution. This new record represents an extension of 275 km to the known distribution of *P. pubens* var. *pubens* and marks the south-eastern limit of the variety. The existing records are located in the west Andes ridge, on the opposite side of the Colombian Andes range. Thus, this is the first record for the Caquetá department and the TMCF of the east Andes ridge, which makes the variety trans-Andean.

According to Galeano & Bernal (2010), this disjunctive distribution of palm populations also occurs with other Andean palm species such as *Aiphanes simplex* Burret (Burret 1932: 567–568), *Chamaedorea pygmaea* H.Wendl. (Wendland 1932: 217–249) and *Prestoea ensiformis* (Ruiz & Pav.) H.E.Moore (Ruiz & Pavon 1798: 297; Moore 1963: 286). Like *P. pubens* var. *pubens,* these species are understory palms, less than 9 m high, growing in Andean montane rainforests and having been recorded only in the west Cordillera and east Cordillera of the Colombian Andes without any report between these areas (Galeano & Bernal 2010). This trans-Andean distribution is known as vicariant populations (Chapman 1926; Barfod et al. 2010).

The Andes range has sinuous distributions of habitat types along altitudinal isoclines on opposite sides of the ridges (Graves 1988; Trénel et al. 2008). This heterogeneity of habitats can offer favourable conditions for palm populations previously separated by the Andes uplift and can permit disjunctive distribution in some cases (Barfod et al. 2010). The Andes orogeny does not necessarily lead to accelerated speciation; for instance, *Ammandra decasperma* O.F.Cook (Cook 1927: 218–223), a palm species with occurrence in the Chocó and Amazonia had its populations



Figures 2–8. *Prestoea pubens* var. *pubens*. **2:** Habit and habitat. **3:** Plant base and roots. **4:** Pinnae. **5:** Flowers. **6:** Inflorescence rachillae. **7:** Infructescence. **8:** Fruits. Photos by O. Perdomo.

split after the Andes uplift in the Pleistocene, and currently presents vicariant populations with morphological similarity (Barfod et al. 2010). Similarly, populations of *P. pubens* var. *pubens* occur in opposite sides of the Andes without presenting any morphological differences. However, the lack of information about environmental conditions, phylogeny, and a complete biogeographic distribution of these taxa do not allow us to assert the reasons for this phenomenon.

Three newly described species of Araceae were recently found in the forests along both sides of the Caraño River: *Philodendron caranoense* Croat et al. (Croat et al. 2013: 31–33), *P. edwinii* Croat & M.Correa (Croat et al. 2013: 35–38), and *P. marcocorreanum* Croat et al. (Croat et al. 2013: 48–49). A first record for the Caquetá department and a range extension for *P. rugosum* Bogner & G.S.Bunting (Bogner & Bunting 1983: 183–185), previously considered endemic to Equador, and *P. schmidtiae* Croat & Cerón (Croat et al. 2013: 60–68), recorded only in Bolivia and Ecuador, were also recently reported (Edwin Trujillo, pers. comm.). Additionally, a first record for the Caquetá department and a range extension for the palm *Chelyocarpus ulei* Dammer (Dammer 1920: 44–51) was reported near this area (Calderón et al. 2015). Such studies highlight the importance of biodiversity studies in this region of Colombia.

The TMCF is dominated by palms, harbour high endemism, and are home to more than 100 palm species, many of which are yet unknown to science (Aldrich et al. 1997; Borchsenius & Moraes 2006; Cuello & Cleef 2009). Systematic efforts to better know the local biodiversity and to strategically use such knowledge to conserve and restore habitats are important to prevent irreversible loss of biodiversity, further natural resource degradation, and loss of ecosystem services. Thus, immediate action is required to conserve the remaining areas of TMCF before their complete loss (Aldrich et al. 1997).

Material examined

Prestoea pubens* var. *pubens — COLOMBIA. El Valle: Municipality of Sabaletas, km 29 highway from Buenaventura to Cali, dense forest, 25 m a.s.l., 4 June 1944, *E.P. Killip and J. Cuatrecasas, 36025 – 36026* (COL). Cauca: Municipality of Guapí, PNN Gorgona Island, 230 m a.s.l., 31 May 1986, *G. Lorenzo and O. Rangel 318524 – 318255 – 318261 – 318664 – 318698* (COL). Valle: Calima river middle basin, forest in steep terrain on the right side of the river in front of the El Cusumbo stream, 900 t0 950 m a.s.l., 21 February 1989, *R. Bernal et al. 416130* (COL). Cauca: Municipality of Guapí, PNN Gorgona Island, pathway to Mirador, 190 m a.s.l., 12 September 1987, *G. Lorenzo and O. Rangel 338790* (COL). Cauca: Municipality of Guapí, PNN Gorgona Island, pathway to Placas, 15 September 1987, *G. Lorenzo and O. Rangel 25428 – 338798* (COL).

Prestoea pubens* var. *semispicata — PANAMÁ. Coclé: above El Copé, 900 m a.s.l., 1 December 1995, *A. Henderson and R. Bernal 374407* (COL).

Prestoea schultzeana — COLOMBIA. Putumayo: Border of Colombia and Ecuador, hygrophyll forest of the San Miguel River, between the Ocana stream and the Teteyé river, 250 m a.s.l., 4,6,7 December 1940, *J. Cuatrecasas 522610* (COL). Amazonas: Municipality of Puerto Nariño, PNN Amacayacu, terra firme forests near the Bacaba Plataform, 03°49′ S, 070°15′ W, 120 m a.s.l., 2 September 2001, *R. Bernal and M. Grussmacher 473618* (COL).

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